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River Bend Station
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William F. Maguire
Site Vice President

RBG-47907

October 31, 2018

Attn: Document Control Desk
U.S. Nuclear Regulatory Commission
11555 Rockville Pike
Rockville, MD 20852-2738

Subject: Licensee Event Report 50-458 / 2018-007-00
River Bend Station, Unit 1
Docket No. 50-458
License No. NPF-47

Dear Sir or Madam:

In accordance with 10 CFR 50.73, enclosed is the subject Licensee Event Report. This document contains no commitments. If you have any questions, please contact Mr. Tim Schenk at 225-381-4177.

Sincerely,

A handwritten signature in cursive script, appearing to read "W F Maguire".

WFM/twf

Enclosure

cc: (with Enclosure)

U.S. Nuclear Regulatory Commission
Attn: Ms. Lisa M. Regner, Project Manager
09-D-14
One White Flint North
11555 Rockville Pike
Rockville, MD 20852

U.S. Nuclear Regulatory Commission
Region IV
1600 East Lamar Blvd.
Arlington, TX 76011-4511

NRC Senior Resident Inspector
Attn: Mr. Chris Speer
5485 U.S. Highway 61, Suite 1
St. Francisville, LA 70775

Public Utility Commission of Texas
Attn: PUC Filing Clerk
1701 N. Congress Avenue
P. O. Box 13326
Austin, TX 78711-3326

INPO
(via ICES reporting)

RB1-18-0186

**LICENSEE EVENT REPORT (LER)**

(See Page 2 for required number of digits/characters for each block)

(See NUREG-1022, R.3 for instruction and guidance for completing this form
<http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1022/r3/>)

Estimated burden per response to comply with this mandatory collection request: 80 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Information Services Branch (T-2 F43), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by e-mail to InfoCollects.Resource@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NE08-10202, (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

1. Facility Name River Bend Station - Unit 1	2. Docket Number 05000 458	3. Page 1 OF 4
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4. Title Manual Reactor Scram due to Reactor Recirculation Pump Trip Caused by Transformer Failure
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5. Event Date			6. LER Number			7. Report Date			8. Other Facilities Involved	
Month	Day	Year	Year	Sequential Number	Rev No.	Month	Day	Year	Facility Name	Docket Number
02	01	2018	2018	007	00	10	31	2018	NA	05000 NA

9. Operating Mode	11. This Report is Submitted Pursuant to the Requirements of 10 CFR §: (Check all that apply)			
1	<input type="checkbox"/> 20.2201(b)	<input type="checkbox"/> 20.2203(a)(3)(i)	<input type="checkbox"/> 50.73(a)(2)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(viii)(A)
	<input type="checkbox"/> 20.2201(d)	<input type="checkbox"/> 20.2203(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(ii)(B)	<input type="checkbox"/> 50.73(a)(2)(viii)(B)
	<input type="checkbox"/> 20.2203(a)(1)	<input type="checkbox"/> 20.2203(a)(4)	<input type="checkbox"/> 50.73(a)(2)(iii)	<input type="checkbox"/> 50.73(a)(2)(ix)(A)
	<input type="checkbox"/> 20.2203(a)(2)(i)	<input type="checkbox"/> 50.36(c)(1)(i)(A)	<input checked="" type="checkbox"/> 50.73(a)(2)(iv)(A)	<input type="checkbox"/> 50.73(a)(2)(x)
10. Power Level	<input type="checkbox"/> 20.2203(a)(2)(ii)	<input type="checkbox"/> 50.36(c)(1)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(v)(A)	<input type="checkbox"/> 73.71(a)(4)
27	<input type="checkbox"/> 20.2203(a)(2)(iii)	<input type="checkbox"/> 50.36(c)(2)	<input type="checkbox"/> 50.73(a)(2)(v)(B)	<input type="checkbox"/> 73.71(a)(5)
	<input type="checkbox"/> 20.2203(a)(2)(iv)	<input type="checkbox"/> 50.46(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(v)(C)	<input type="checkbox"/> 73.77(a)(1)
	<input type="checkbox"/> 20.2203(a)(2)(v)	<input type="checkbox"/> 50.73(a)(2)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(v)(D)	<input type="checkbox"/> 73.77(a)(2)(i)
	<input type="checkbox"/> 20.2203(a)(2)(vi)	<input type="checkbox"/> 50.73(a)(2)(i)(B)	<input type="checkbox"/> 50.73(a)(2)(vii)	<input type="checkbox"/> 73.77(a)(2)(ii)
	<input type="checkbox"/>	<input type="checkbox"/> 50.73(a)(2)(i)(C)	<input type="checkbox"/> Other (Specify in Abstract below or in NRC Form 366A)	

12. Licensee Contact for this LER
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Licensee Contact Tim Schenk, Manager - Regulatory Assurance	Telephone Number (Include Area Code) 225-381-4177
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13. Complete One Line for each Component Failure Described in this Report									
Cause	System	Component	Manufacturer	Reportable to ICES	Cause	System	Component	Manufacturer	Reportable to ICES
B	AD	XFMR	GE	Y	NA	NA	NA	NA	NA

14. Supplemental Report Expected	15. Expected Submission Date	Month	Day	Year
<input type="checkbox"/> Yes (If yes, complete 15. Expected Submission Date) <input checked="" type="checkbox"/> No		NA	NA	NA

Abstract (Limit to 1400 spaces, i.e., approximately 14 single-spaced typewritten lines)

On February 01, 2018 River Bend Station was performing a plant startup. At approximately 27% power, an attempt was made to shift Reactor Recirculation Pump 'B' from slow to fast speed. A failure in the pump motor transformer caused the pump to trip during the upshift, requiring entry into AOP-0024, Thermal Hydraulic Stability Controls and GOP-0004, Single Loop Operation. Both procedures require monitoring core flow using the Validated Core Flow Emergency Response and Information System computer data point (WTX). When operators observed the data point they noted that it was "Suspect" and magenta in color, persuading the control room team to question the validity of WTX. The control room team engaged Nuclear IT to help resolve the anomaly. The control room team attempted to use several alternate indications of core flow, but ultimately was unable to reconcile the anomaly with the quality and color of WTX. Although the reactor was in compliance with Technical Specifications, the decision was made to conservatively shutdown the reactor. Nuclear IT contacted the operating crew several minutes after the shutdown to inform them that the data provided by WTX was indeed valid. AOP-0024 and GOP-0004 were revised, the color of "Suspect" data points was changed, and an extent of condition review was performed to determine if other transformers with the same vulnerability exist.

**LICENSEE EVENT REPORT (LER)
CONTINUATION SHEET**

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1. FACILITY NAME	2. DOCKET NUMBER	3. LER NUMBER		
River Bend Station - Unit 1	05000- 458	YEAR	SEQUENTIAL NUMBER	REV NO.
		2018	007	00

NARRATIVE**A. PLANT CONDITIONS PRIOR TO THE EVENT**

On February 1, 2018, River Bend Station (RBS) was operating in Mode 1 at approximately 27% power, performing a plant startup following a mid-cycle outage. Reactor Recirculation [AD] Pump 'A' was operating in fast speed and Reactor Recirculating Pump 'B' was operating in slow speed.

B. BACKGROUND**Reactor Recirculation System**

The purpose of the Reactor Recirculation System (RCS) is to provide the driving flow to the jet pumps to circulate reactor coolant through the core. The RCS provides forced coolant water flow through the core to increase the core power density and to remove heat from the fuel. The RCS, in conjunction with the Recirculation Flow Control System, provides a means of controlling reactor power over a limited range by varying the coolant flow through the reactor core at a controlled rate. Forced circulation of coolant water through the core allows a higher power level than could be achieved with natural circulation.

Normal power for the Recirculation Pump motor is from an oil filled step-down transformer (**XFMR**) which is designed to accelerate the motor to full speed in 10 seconds. With reactor power less than approximately 30%, the Recirculation Pump Motor is powered from the Low Frequency Motor Generator (LFMG) set which runs the motor at a slow speed of 450 rpm.

Plant Computer Systems

The Emergency Response and Information System (ERIS) provides on-line monitoring of approximately 1,200 plant process variables. The system monitors both digital and analog input signals at specified intervals, performs calculations with selected input data, processes the data, and can produce meaningful displays, logs, and plots of plant performance representing safety related and transient response data.

The Orbital Network Engineering ONE system is a server system consisting of a central processor, random access memory, hard drives, analog and digital input/output modules, time standard synchronization, and self-error checking. The Validated Core Flow ERIS point (WTX) is produced from input from ONE.

C. DESCRIPTION

On February 01, 2018 River Bend Station was performing a plant startup following a mid-cycle outage. At approximately 27% power, an attempt was made to shift Reactor Recirculation Pump 'B' from slow to fast speed. The pump tripped during the upshift at 09:46, requiring entry into AOP-0024, Thermal Hydraulic Stability Controls and GOP-0004, Single Loop Operation. Both procedures require the operating crew to monitor core flow to determine if the core is in a power to flow region where thermal hydraulic instabilities are more likely and to verify Technical Specification requirements are met. Both procedures instruct operators to use WTX to monitor core flow. Operators found that the quality of the core flow value provided by WTX was tagged as "Suspect". The color of the value on the visual display was also magenta in color. The control room team was concerned that WTX was not providing reliable data due to the magenta color and "Suspect"

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quality. Although the value for the point closely matched core monitor predicted flow for this plant condition and was consistent with what flow should be, the color and quality of the computer point led to confusion. The control room team engaged Nuclear Information Technology to help resolve the anomaly. The control room team attempted to use several alternate indications of core flow, but ultimately was unable to reconcile the anomaly with the quality and color of WTX. The decision was made to conservatively shutdown the reactor. A manual reactor scram was initiated at 10:57. Nuclear IT contacted the operating crew several minutes after the shutdown to inform them that the data provided by WTX was indeed valid.

All plant systems responded as expected following the scram. The cause of the Reactor Recirculation Pump 'B' trip was determined to be a fault in the pump motor transformer. The transformer was replaced and the plant was returned to normal full power operation.

D. CAUSE**Reactor Recirculation Pump 'B' Trip**

The Reactor Recirculation Pump motor transformer was sent to a third party vender for an as found inspection. An internal transformer fault was found on the high voltage 'A' phase winding connection from the winding exit leads to the transformer bushing. This connector was crimped together with some amount of fill (solid copper bar) added to provide uniform pressure across the crimp. The fill used was inappropriately sized resulting in an inadequate crimp. This flaw in addition to thermal cycling of the connection/crimp over the service period of the transformer (through pump starts/shifts to fast speed), developed a hotspot due to higher resistance and, ultimately, resulted in connection failure.

Uncertainty of Computer Data Point Validity

The quality of WTX in this case is determined by the input used in the calculation that produces the data. If the default input is used in the calculation WTX quality is flagged as "Good". If an alternate input value is used WTX quality is flagged as "Suspect".

Because RBS was in Single Loop Operation (SLO), WTX was automatically calculated using the core plate delta-pressure based value which is an alternate method. This alternate method is accurate regardless of pump speed and loop flows. However, because the input used in the calculation was an alternate method, WTX quality was tagged as "Suspect". All data points tagged as "Suspect" are automatically turned to magenta in ERIS.

To conclude, for this event the Validated Core Flow ERIS point, WTX, which was referenced by the Operators per AOP-0024 and GOP-0004, was accurate regardless of pump speed and loop flows. The point was magenta on ERIS because it was correctly using an alternate method to calculate core flow using core plate delta-pressure. The alternate method was in use due to SLO.

E. REPORTABILITY

This event is being reported under 10CFR50.73(a)(2)(iv)(A) as an event or condition that resulted in manual or automatic

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actuation of the Reactor Protection System including a reactor scram or a reactor trip.

F. CORRECTIVE ACTIONS

AOP-0024 and GOP-0004 were revised to include diverse computer points and a means to determine core flow that is not dependent on plant computer systems.

The color for a "Suspect" data point has been changed to orange.

An extent of condition review was performed to determine if other transformers with the same vulnerability encountered with the failed transformer exist.

G. SAFETY SIGNIFICANCE

The condition of the station after the trip of Reactor Recirculation Pump 'B' during the upshift from slow to fast speed was stable and permissible in accordance with Technical Specifications and station normal operating procedures. The inability to reconcile the ERIS computer point was aggressively pursued by the station, but did not reach a conclusion until after the plant had been shut down. At no time was River Bend Station required to shut down by any station procedures or Technical Specification. The decision to shutdown was conservative, deliberate and controlled. This event had minimal significance to the health and safety of the public.

H. PREVIOUS SIMILAR OCCURRENCES

The WTX data point was noted as "Suspect" and magenta in color in 2012 during SLO operation. However, this information was not adequately distributed to Operations Department Training nor was it added to AOP-0024 or GOP-0004.

There have been several instances of the Reactor Recirculation Pumps tripping during transfers to fast speed. However, this was the first time a Reactor Recirculation Pump tripped due to a failure of the pump motor transformer.

(NOTE: Energy Industry Identification System component function identifier and system name of each component or system referred to in the LER are annotated as (**XX**) and [XX], respectively.)